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Tribe or title? Ethnic enclaves and the demand for formal land tenure in a Tanzanian slum

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Abstract

This paper examines the relationship between ethnic heterogeneity and the demand for formal land tenure in urban Tanzania. Using a unique census of two highly-fractionalized unplanned settlements in Dar es Salaam, I show that households located near coethnics are significantly less likely to purchase a limited form of land tenure recently offered by the government. I attempt to address one of the chief concerns - endogenous sorting of households - by conditioning on a household's choice of coethnics neighbors upon arrival in the neighborhood. I also find that coethnic residence predicts lower levels of perceived expropriation risk, but not perceived access to credit nor contribution to local public goods. These results suggest that close-knit ethnic groups may be less likely to accept state-provided goods due to their ability to generate reasonable substitutes, in this case protection from expropriation. The results are robust to different definitions of coethnicity and spatial cut-offs, controls for family ties and religious similarity as well as spatial fixed effects. Finally, the main result is confirmed using a large-scale administrative data-set covering over 20,000 land parcels in the city, exploiting ethnically-unique last names to predict tribal affiliation.

Keywords: Ethnicity, Land tenure, Tanzania, Unplanned settlements

JEL classification: J15, Q15, R23

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1 Introduction

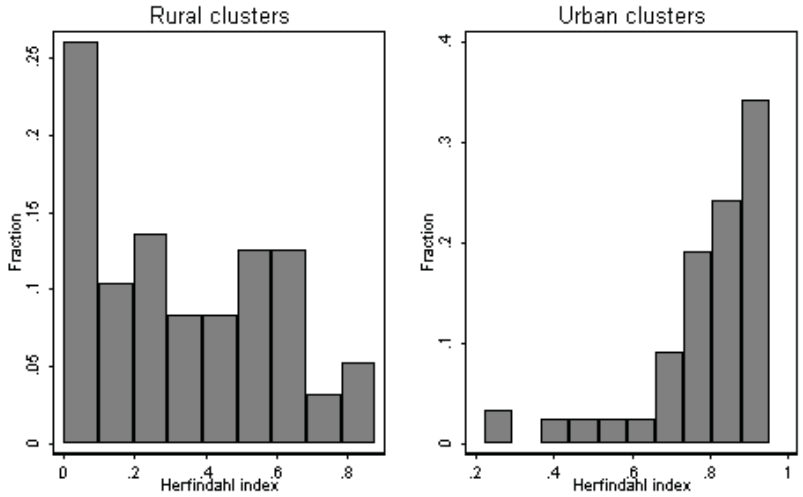
In the last fifty years the proportion of the African population living in urban areas has more than doubled (UN-HABITAT 2010). A common feature of this rapid urbanisation is the growth of unplanned settlements, characterized by high population density, insecure tenure and low levels of infrastructure and public services. Over 61% of sub-Saharan Africa's urban population lives in slum conditions (UN-HABITAT 2010). Most governments have been keen either to curb this informal growth or tackle existing settlements through slum upgrading, which usually entails infrastructure investment, land registration and the introduction of formal tenure instruments (Deininger, Augustinus, Enemark, and Munro-Faure 2010). However, such endeavors can be expensive (Woodruff 2001) and many governments rely on innate demand for formal land tenure to drive their titling programmes. This approach is not always successful: in the context of this paper, Tanzania, there has been consistently low-levels of demand for the various forms of formal land tenure offered in urban areas.

Another feature of rapid urbanisation has been the integration of some very diverse, segregated societies. This is especially true of Tanzania, which has one of the highest levels of ethnolinguistic fractionalisation in the world. Table 1 shows the average tribal Herfindahl Index[1] defined over rural and urban clusters from the World Bank's 1993 Human Resource Development Survey, one of the few representative surveys which has recorded data on tribal affiliation in Tanzania.

While the modal rural cluster is perfectly homogenous, with a Herfindahl Index of zero, the modal urban cluster is marked by an extremely high degree of heterogeneity, the end result of high levels of rural-urban migration. While there is already some evidence that such large scale desegregation is highly beneficial for outcomes like trust and quality of governance (Alesina and Zhuravskaya 2011), one might question how the movement of people from homogenous societies with similar customs and traditions (such as customary land tenure) to very mixed, heterogenous environments might affect their demand for state-led formalisation.

[1]The Herfindahl Index is a common measure of heterogeneity. For any setting with N groups, each with a different population share $s_1, s_2, \ldots s_N$, the Herfindahl Index is calculated as $1 - \sum_{n=1}^{N} s_n$, and can be interpreted as the probability that any two individuals selected at random come from *different* groups.

Figure 1: Ethnic fractionalisation in Tanzania



Notes: Author's calculations from 1993 Human Resource Development Survey
Figure shows distribution of cluster-wide Herfindahl Index across Rural and Urban clusters.

The focus of this paper is on the interaction between these two facets of urbanisation: does ethnic sorting hurt or hinder efforts to formalise unplanned settlements? To do this, I use data from a unique census of a large slum in Dar es Salaam to investigate whether or not households living near neighbours of the same ethnic background are less likely to accept a limited form of land title recently offered by the Tanzanian government. The main challenge to identification comes from endogenous sorting: households can choose which parcels of land they wish to acquire, so unobserved household characteristics might be driving both the decision to locate with coethnics and the demand for formal tenure. I attempt to bypass these concerns by controlling for how ethnically-similar the household's neighbours were at the time the household moved into the slum, using variation in the ethnicity of neighbours who arrived at a later date to drive the result.

The results suggest that the impact of having neighbours from the same ethnic background on the demand for formal tenure is consistently negative, even when using different measures of 'coethnicity', different distance cutoffs for who qualifies as a neighbour, and controls for the religious similarity as well as proxies for nearby relatives. The results are also robust to the inclusion of spatial fixed effects, introduced to control for any spatially-correlated unobservable characteristics. They also appear to be present in

a larger administrative data-set covering most of the unplanned settlements of Dar es Salaam, where I have 'imputed' tribal affiliation using ethnic-specific last names taken from the slum census. While the exact channels are difficult to identify, I argue that the negative coefficient is due to a variety of factors which reduce a household's expropriation risk when they are surrounded by coethnics, reducing the need for a formal title. This is supported by the data, which suggest that households living near coethnics are less fearful of losing their land.

This paper makes several contributions to the literature. First, while many studies have considered the aggregate impact of ethnic heterogeneity on community or national-level outcomes, few have focused on decisions made at the household level with respect to the adoption of state-provided goods. Second, to my knowledge this is the first empirical study to show that differences in how households are ethnically sorted *within* a community can have a non-negligible impact on their acceptance of a formal system, a result which might be shrouded when only aggregate levels of ethnic heterogeneity are used. Finally, while many studies have suggested that rural-urban migration leads to a breakdown of social ties commonly observed in tribal networks (Lilleør and Lassen 2008), this work shows that these ties can still play a role in an urban setting.

In Section 2 I will discuss what we know from the literature about how coethnics interact with each other, the context of ethnicity in Tanzania and a framework for the hypothesis that households living with coethnics will be less likely to accept an offer of formal tenure from the government. In Section 3 I will discuss the data gathered from Dar es Salaam, the empirical model and construction of the relevant variables, as well as my main identification strategy. Section 4 will present and discuss the main results, Section 5 will cover robustness checks and I will conclude with Section 6.

2 Context and framework

2.1 Land rights in Tanzania

While rural land ownership and distribution in Tanzania have historically been dictated either by customary law or by the large scale 'villagisation' and collectivisation experi-

enced under Julius Nyere's *Ujamaa* policies, urban land has officially been owned and allocated by the central government, itself initially hostile to the growth of informal settlements (Kironde 2006). Despite the government's position and *de jure* ownership of all urban land, informal acquisition by migrants continued nearly unabated in the years following independence, with *de facto* tenure arrangements being supported either through customary law or informal arrangements of ownership (De Soto and Cheneval 2006).

Much of this changed with the passing of the 1999 Land Act and Village Land Act, which restricted the mandate of customary law to rural villages, implicitly removing the government's recognition of customary land holdings in urban areas. While informal ownership in urban areas was acknowledged in this new legislation, formal recognition of tenure would only be made available to those who purchased a land title authorised by the Ministry of Lands. The Land Act also introduced two new forms of title targeted at urban landowners: the residential license (RL) and the certificate of right of occupancy (CRO). A 99-year leasehold, the CRO is closer to what one would expect of a full title, with large implications for tenure security and collateral. However, the government has seen almost nonexistent progress in rolling these titles out to the residents of the unplanned settlements, instead focusing much of its recent attention on on providing residential licenses.

This paper will be primarily concerned with this residential license (known as a *leseni ya makazi* in Swahili). Residential licenses are short-term leases of urban land from the central government,[2] initially with a renewable two year duration, although this was later extended to five years. Seeing them as a stepping-stone to full title, the Tanzanian Ministry of Lands has focused most of its attention since the passing of the Land Act on getting urban landowners registered with residential licenses.

Aside from the inconvenience of requiring a periodic renewal, RLs are limited in several other ways: they are non-transferable, so new owners must purchase a new RL even if the previous owner already owned one. They were initially also seen as insufficient for obtaining credit: banks in Tanzania showed little interest in making loans on the basis

[2]Despite the fact that an RL is a leasehold, the central government generally does not allocate this land, nor does it claim it back after an RL expires. The expiration of a RL can seen as an expiration of the government's *recognition* of ownership.

of such a short term leasehold. However, recent anecdotal evidence has suggested that after RLs were extended to five years, many microfinance lenders began accepting them as collateral. Residential licenses are also expected to provide a degree of private tenure security. Not only do they provide households with a government document certifying them as the landowner, but they are also registered as residential license holders in the municipal government's database. Additionally, while the government's official policy on post-expropriation compensation is murky, by some accounts the residential license also guarantees the owner compensation after holding the title for three years or longer (Kironde 2006).

The base price for a RL is roughly $7, or approximately 5% of median household income in this setting, yet one of the prerequisites to applying for one is the payment of two forms of taxation: land rent and property tax. A further implication of these requirements is that households who opt in to the RL system are easier to track and tax. This not only raises the price each household faces, but might also change the very nature of the purchase decision. Rather than weighing the direct benefit a residential license has in reducing expropriation risk versus the price, the decision to purchase an RL might be part of a grander bargain: allowing the government to extract tax in exchange for more public services (such as slum upgrading and tenure security). While I will largely present the trade-off between tribe and title as a simple story of expropriation risk, it is also possible that there are larger trade-offs at hand.

2.2 How do coethnics interact?

Much of what we know about how coethnics interact is derived from literature on the correlates of ethnic heterogeneity, which has suggested that coethnics have greater levels of trust (Alesina and La Ferrara 2002; Zerfu, Zikhali, and Kabenga 2008), which can have implications as far reaching as tax compliance (Lassen 2007). There is also some evidence, thanks primarily to the work of Habyarimana, Humphreys, Posner, and Weinstein (2007), that coethnics have a distinct advantage in reaching cooperative outcomes, either because they have a *strategy-selection* advantage (i.e. coethnics fall back on norms of cooperative strategies) or because they have a *technological* advantage in enforcing cooperative

outcomes through mechanisms such as social sanctions.

This evidence is primarily confined to experimental settings, but the literature has broadly concluded that these mechanisms produce observable differences in real life collective action outcomes such as public goods provision, where coethnics are again seen to have a significant advantage in many settings (Alesina and Ferrara 2000; Miguel 2004; Miguel and Gugerty 2005; Algan, Hémet, and Laitin 2011), although this relationship is not quite ubiquitous (Glennerster, Miguel, and Rothenberg 2010).

Also, perhaps more closely related to the theme of this paper, there is a growing body of work on the effect of migrating into an 'enclave', or ethnically-similar environment. Most of these studies are confined to Scandinavian countries preoccupied with immigration, many of them showing positive effects of coethnic sorting on labour market outcomes (Edin, Fredriksson, and Åslund 2003; Damm 2009). There has been little work on the effect of coethnic sorting on the demand for government-provided public goods, save for one study which finds no correlation between living in an enclave and support for the size of government (Gerdes 2011).

2.3 Ethnicity in Tanzania

There has been some debate over the extent to which ethnicity remains a salient issue in Tanzania, which saw universal adoption of Swahili as well as the firm establishment of a national identity in the years following independence (Polome 1980; Court 1984). The Tanzanian government has not gathered any census data on ethnic affiliations since 1967, considering the matter to be taboo. In the latest round of the Afrobarometer survey, 67% of respondents in Tanzania responded that they "feel only Tanzanian", when asked about their national and ethnic identities (compared to 20-24% of Nigerians, Ghanians, Malawians and Kenyans).[3] Miguel (2004) compared differences in ethnic heterogeneity and public goods provision between villages on either side of the Kenyan-Tanzanian border and found that ethnic heterogeneity only negatively impacted provision on the Kenyan side.

Despite the obvious strength of Tanzanian national identity, there are still signs that

[3]Own calculations.

Table 1: Trust within and across tribes

Year	**Mean**		
	Trust tribe members?	Trust other tribe?	Diff (1-2)
2001	0.77	0.68	0.08***
2005	0.32	0.22	0.10***
Total	0.60	0.51	0.09***

Notes: Data taken from Afrobarometer Survey, Rounds 1 and 2.
Third column shows results of t-test of difference of means between first two columns.

many urban Tanzanians readily recognise and identify with their ethnic origins. Respondents in our survey had no difficulty in identifying their tribe of origin, and over 50% of landowners considered themselves fully fluent in their tribal language. There is also evidence that tribalism still affects trust: Table 1 displays some data from the first two rounds of the Afrobarometer survey in Tanzania, where respondents were asked if they trusted people from within their own tribe and from other tribes. While the differences between the two levels of trust are not massive, they are still significant. Finally, some recent work by Lilleør and Lassen (2008) has revealed a connection between tribal heterogeneity and social capital in Tanzania, the latter measured using remittances from family members who have migrated out (under the assumption that communities with higher levels of social capital are better able to enforce remittance compliance).

Tanzania has a high degree of ethnolinguistic fractionalisation, yet much of this diversity is confined to urban areas, as indicated before in Figure 1. The stark difference in tribal heterogeneity between rural and urban areas is perhaps one of the main drivers of the dichotomy between rural and urban land policy: while the Village Land Act allowed homogeneous rural communities with similar practices to use customary law as a precedent, the Land Act ensured that urban areas were subject to formal, individualistic land rights.

2.4 The demand for formal land tenure

Given what we know about the way coethnics interact with one another, how might the presence of coethnics depress or reinforce the demand for formal land tenure?

For one, greater levels of trust with one's neighbours may lead to lower levels of per-

ceived expropriation risk. Macours (2007) shows that Guatemalan landowners who lack the security of formal tenure are more likely to lease land out to coethnic tenants than non-coethnics. Marx, Stoker, and Suri (2013) show that tenants in Nairobi's Kibera slum invest more in their homes when their landlords or the local chief are from the same tribe. A household might also be better defended from challenges outside its immediate neighbourhood if it is surrounded by coethnics. In the absence of formal tenure arrangements, land disputes are typically settled locally (Kombe and Kreibich 2002), where the side with the larger cohort would have an advantage. Kombe and Kreibich (2002) describes how informal security of tenure in Dar es Salaam is highly dependent on local acceptance:

> "Like in Kihonda and the other informal settlements studied, social-recognition of an individuals rights on land by other settlers, especially the adjoining landowners, by local leaders and relatives or friends is the key factor guaranteeing security of tenure."

Durand-Lasserve (2003) refers to this mix of old-style customary tenure and informal systems as the "neo-customary" tenure system. Anecdotally, this social recognition appears to be crucial to informal tenure security: during field-work in the area of study, the research team interviewed a landowner who, returning from a ten-day trip, found that an undeveloped portion of his land had been sold off and that a house was already being built in its place. The landowner complained that his neighbours, with whom he had a poor relationship, had supported the sale in his absence.

Occasionally disputes make their way to the courts, which have sometimes deferred to customary law (Kironde 2006), where again numbers may play a role. One could also think of tenure as a 'club' good over which coethnics have distinct advantage of self-provision. Non-coethnics lack this advantage, and so if neighbour-enforced informal tenure and government-provided formal tenure are substitutes, non-coethnics should be more likely to embrace the latter.[4] Finally, while it may not have a direct impact on expropriation risk, coethnics are known to have an advantage in creating risk-sharing

[4]Of course, informal and formal tenure arrangements can also be complementary, or even orthogonal, which would suggest either a positive or zero relationship with coethnic sorting.

networks (Grimard 1997) and a household which loses its land might have a softer place to land if surrounded by coethnics.

The interaction between ethnicity and the demand for formal titling might not only be dependent on concerns over expropriation. As several studies have suggested that credit is often provided along ethnic lines (Fafchamps 2000; Biggs, Raturi, and Srivastava 2002; Fisman 2003), households which are ethnically-isolated may look to other solutions for borrowing, such as formalising their property to either use it as collateral (Besley 1995) or to signal their credit-worthiness to lenders (Dower and Potamites 2012). Similarly, if households obtain formal tenure as a means of paying for local public goods (residential licenses require annual payment of property tax), those from ethnically-fractionalised neighbourhoods may face a natural disadvantage in self-provision, so will be more likely to turn to the state to provide these goods.

There might also be 'negative' reasons why households living near coethnics would have lower demand for formal tenure. One common feature of kin networks is a cultural imperative to share wealth (Platteau 2000) and there is growing evidence that households will often hide a portion of their income for fear of ill-treatment from their kin (Jakiela and Ozier 2012). Investment in land, either directly or indirectly through tenure formalisation, might be looked down upon by one's neighbours if they happen to be kin. Similarly, some models of kin networks predict that ethnic groups are worried that members will exit the 'club' and migrate to the formal sector, thus undermining the whole network (Hoff and Sen 2006). To prevent this, they raise costly barriers to exiting, preventing households from leaving, or, in this context, embracing formal tenure. It is also possible that coethnics might actually be a larger threat to tenure security than outsiders: Midheme (2007) cites instances in the Dar es Salaam slum of Midizini where landowners shared land with kin, only to have their relatives attempt to register the land formally in their own name.

Note that while it is very difficult to empirically distinguish between these different mechanisms, they all result in the same basic prediction: that the presence of nearby coethnics should reduce a households demand for formal land tenure. The presence of coethnics might also push households towards formalisation, as land registration could act as a way for households to decouple from customary inheritance obligations, preventing

kin from inheriting land they wish to pass on to someone else. Also, if coethnic neighbours are more likely to communicate and share information, information about land titles might spread quicker amongst these groups, promoting adoption through social interactions.

Finally, many of these theories assume that titling, on the whole, results in positive outcomes for adopting households. However, in certain contexts large-scale titling could make communities worse of if, for instance, it made it easier for governments to tax them without providing anything in return. For instance, there is anecdotal evidence that Dar es Salaam's residential license scheme failed because the government failed to fulfill its promise to reciprocate the increase in property tax contributions with systematic slum upgrading. This could leave communities unambiguously worse off. If the individual returns to titling are high enough to induce households to move to this "high-tax" state, then only substantial coordination amongst households might keep neighbourhoods from ending up in this equilibrium. Coethnics would likely have a distinct advantage in coordinating to avoid titling if large-scale adoption would make everyone worse off.

The rest of this paper will be concerned with testing whether or not having coethnic neighbours is associated with different levels of demand for formal land tenure, in the context of a slum in Dar es Salaam where residential license were recently introduced.

3 Data and empirical model

3.1 The Tanzanian Land Rights Survey

In the summer of 2010 the University of Oxford conducted a census of land parcels in two adjacent *mitaa* (subwards) in the district of Kinondoni, Dar es Salaam. The two communities, Kigogo Kati and Mburahati Barafu, are unplanned, low-income communities located less than five kilometers from the center of the city.

The aim of the Tanzanian Land Rights Survey (TLRS) was to cover every parcel of land listed in the Kinondoni property register, a database of all presumed property owners constructed in 2004. The result of the survey is a sample of 2,384 individual parcels of land across the two mitaa. The survey data includes detailed information on the characteristics of the owning household and the parcel itself. Property owners were

also asked about the tribal affiliation of every member of the household, which will provide a basis for measuring coethnicity in Section 3.4. First I will consider the empirical model I will use to examine the relationship between coethnic location and the demand for formal tenure.

3.2 Empirical model and framework

Following from the discussion in Section 2.4, there are a number of theoretical reasons why a household's demand for formal tenure might be reduced by the presence of coethnics in the neighbourhood. Consider a household's latent demand for a residential license, defined as a function of household characteristics $\mathbf{X}_i$ and the proportion of neighbours who are coethnic c_{i_N}. Given some simple assumptions over the structure of the error term, it is straightforward to re-write the household's demand equation as a linear probability model in which both c_{i_N} and $\mathbf{X}_i$ affect the probability of purchasing a residential license:

$$RL_i = \gamma + \theta c_{i_N} + \beta \mathbf{X}_i + \delta \overline{\mathbf{X}}_{i_N} + L_i + u_i + \varepsilon_i \tag{1}$$

Where RL_i is an indicator variable equal to one if index household i has ever acquired a residential license for its parcel.[5]. Again, c_{i_N} is a measure of ethnic similarity between i and its relevant neighbour set N, both of which I will describe further in the next section.

The key parameter of interest is θ, the effect of coethnic neighbours on the propensity to adopt a residential license. If, as described in Section 2.4, the presence of coethnics reduces the demand for formal tenure, then estimates of θ should be negative. If titling decisions are independent of any spillovers from nearby coethnics, then any tests of θ should fail to reject a null hypothesis of zero. Finally, if coethnics generate a demand for tenure, either by pushing households away or through information peer effects, then θ might be greater than zero. While I will argue in this section that it is will be possible to identify θ, neither a positive nor negative result would be enough to directly identify the channel through which coethnicity affects tenure demand. Thus, even if estimates of θ are strictly less than zero, we cannot discern whether or not this is due to complementarity

[5]Some households may have obtained a RL but then let it expire by the time of the survey. The questionnaire did not specify whether or not the household currently has a residential license

in expropriation risk, for instance, or coethnics directly preventing their neighbours from signing up. However, in Section 4.2 I will investigate whether or not coethnics also have an effect a few potential channels, such as expropriation risk and public goods expenditure, in an attempt to better identify the mechanisms through which coethnic affects tenure demand.

Returning to equation (1), $\mathbf{X}_i$ is a vector parcel and owner household characteristics, the contents of which I will describe shortly. $\overline{\mathbf{X}}_{i_N}$ is the average of $\mathbf{X}_i$ across i's neighbour set. In the context of the peer effects literature, δ measures *contextual/exogenous* peer effects (Manski 1993). L_i is a vector of geographic characteristics for parcel/household i, which is intended to capture any *correlated effects*, another concern of the peer effects literature. For example, if coethnics are more likely to cluster in areas where tenurial investment incentives are low, such as in hazardous areas like flood plains, a negative estimate of θ may be the result of these common characteristics, rather than coethnicity itself. The parameter u_i is a vector of unobserved household or land characteristics thought to be correlated with both RL_i and c_{i_N}. This is my chief concern for identification, which I will discuss further in Section 3.5.

Finally, despite my hints that the parameters in this specification have a distinct peer effects interpretation, equation (1) explicitly excludes an *endogenous* peer effect. That is, the characteristics of household i's neighbours are allowed to affect i's residential license choice, but not their take-up, $\overline{RL}_{i_N}$. This is essentially a reduced-form version of a standard Manksi-style peer effects equation, where any estimate of θ might comprise the net effect of coethnicity, operating through any observed endogenous peer effects, rather than just as a purely exogenous peer effect. While there might be positive endogenous peer effects in residential license take-up, the identification issues created by including them in this specification would distract from the main objective of identifying coethnic effects.

Next, I will discuss how the neighbour set and measure of coethnicity, the two chief components of c_{i_N}, are constructed.

3.3 Choosing an appropriate neighbour set

There is already good reason, a priori, to believe that the relevant social network for a household is characterized by geographic proximity. Prior to the start of survey work, researchers randomly selected 10 households from each 'block' of parcels (these blocks were arbitrarily defined by the municipality) to frame a small network questionnaire. During the survey, each respondent was asked if they knew any of the households from the list. Figure 2 shows the results of a kernel regression of the probability that household i knows household j on the distance in meters between i and j's parcels. The chance of a connection between i and j drops off sharply with distance, with the greatest drop occurring within the first 50 meters.

Not only are close neighbors more likely to know and interact with one another, but they may also have special status with respect to land tenure. While it is not a requirement for obtaining a residential license, other forms of land registration often require the signature of the four closest neighbors to verify ownership. Proximate neighbors also pose the biggest threat to tenure security, as they might be more likely to make ownership challenges than households further away.

I define the relevant neighbour set as every household/parcel with a border within a given distance d of the index parcel.[6] However, the choice of d is a challenge in itself. Intuition suggests that contiguous neighbours may be the most important. However, land acquisition in this area is characterized by subdivision, either through sales (I sell my front yard to a new arrival) or through inheritance (I cede my front yard to my newly-wed son or daughter). This suggests that existing owners have significant control over who moves directly next to them. Thus, while it is tempting to set $d = 0$ and use only contiguous neighbours in the analysis, this results in a neighbour set the household has very likely chosen, and thus concerns over correlation with u_i grow.

Setting d too high also runs the dual risk of allowing in too many neighbours who have

[6] In this paper I use a distance band specification instead of a more standard nearest-neighbour approach. As I explain later in the section, I will not be relying on variation in the ethnicity of contiguous neighbours due to concerns over endogeneity. To ensure that there is enough variation to identify an effect, I have used relatively large neighbour sets. Doing so with nearest-neighbour sets can be troublesome, as the nearest nth neighbour can be very distant for some observations (such as a case where a cluster of $n-1$ households is isolated from the rest of the community). In this case, distance-band measures might be more reasonable proxies for the surrounding environment.

Figure 2: Distance and social connections

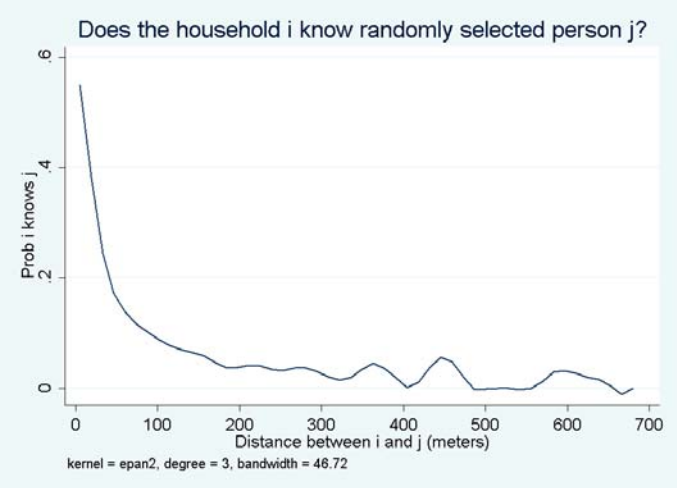


Figure 3: Example of neighbour set using 50m threshold

little relevance for parcel i's tenure security and trading off too much geographic variation in c_{i_N} for tribe-specific variation.[7] As a compromise, I set $d = 50m$, thus including all neighbouring parcels within 50 meters of the index household's borders. Figure 3 shows an example of the neighbour set for a randomly-chosen parcel in the sample. Fifty meters may appear to be an arbitrary choice, but it has the benefit of being a reasonable cutoff for two households knowing one another, as evidenced by Figure 2. Later on, in Section 5.3, I will consider how alternate values of d affect the main results.

[7] As d increases, c_{i_N} will eventually converge to a neighbourhood-level estimate. For example, if d is large enough to consider all other parcels in the neighbourhood, all households of the same tribe will have the same estimate of c_{i_N}.

3.4 Choosing coethnicity measures

The household roster questionnaire for the TLRS contains a single question which will form the basis for this measure: "what is your tribe?" Respondents were allowed to choose from an extensive list of tribes derived from *Ethnologue*, a language encyclopedia (Lewis 2009). If unhappy with the choices offered, their subjective response was recorded. 97% of responses were directly mappable to *Ethnologue*'s classification, with over 70 different tribes represented. Those that could not be matched with a known tribe or language group have been dropped from the analysis.

It seems that, within the Tanzanian context, tribal affiliation is a reasonably objective measure of ethnic affiliation, circumventing many of the problems associated with self-identification measures. Despite the government's aversion towards recording ethnic data, "what is your tribe?" seems to be as straightforward and uncontroversial a question in Dar es Salaam as "where did you go to school?". The results reveal that the unplanned settlements are incredibly diverse: the Herfindahl Index for the sample is 0.91. Figure 4 illustrates this high degree of heterogeneity, with each tribe coded with a separate color.[8]

While a simple measure of coethnicity would be a tribal dummy equal to one if two households are from the same tribe and zero otherwise, this might be too restrictive a measure. Studies which use such a highly disaggregated definition of ethnicity have been open to criticism that they throw away crucial information on cultural similarity *between* ethnic groups (Desmet, Ortuño-Ortín, and Wacziarg 2012). For example, consider the language tree in Figure 5: using a simple tribal measure of coethnicity would assign a value of zero to both a Sagala-Asu and a Sagala-Ngulu pairing, even though the Sagala and Ngulu tribes share a common language branch and are presumably closer in many ways than the Sagala and the Asu.

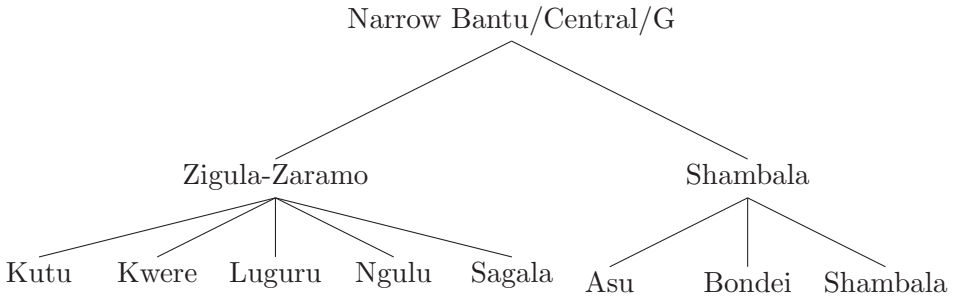
Using a more aggregate measure of tribe trades off variation in coethnicity with more accurate information on the linguistic differences between tribes. For example, aggregating to the highest level possible results in over 99% of the sample being relegated to a single language group (Niger-Congo). A reasonable trade-off (and the one I will suggest) is to aggregate up to the second row in Figure 5, to what I will refer to from now on as

[8] Actual tribe names are not revealed here for purpose of anonymity.

Figure 4: Tribal heterogeneity of sample

Note: Each colour represents a different tribe

Figure 5: Language tree example



Note: Bottom level names indicate tribes, mid-level stems indicate language stems, and top-level indicates language group.

the *language stem*. This reduces the measured ethnic heterogeneity in the sample from a Herfindahl of 91% to 83% and the number of ethnic groups to thirty-two.

The coethnicity measure is derived as follows: each household i is paired with every other household in its neighbour set N. For every pairing, an indicator variable is constructed which is equal to 1 if both households are from the same language stem and 0 otherwise. This indicator is then averaged across the neighbour set, so c_{i_N} can be interpreted as the percentage of households in i's neighbour set from the same language stem.

Of course, the language stem might not be the most appropriate or relevant measure of ethnic similarity. While I will use it as my main measure for this paper, I also consider two other measures: one based on Fearon's (2003) index of 'cultural similarity', which uses *all* information from the language tree and the other using the geographic distance between tribal homelands as a proxy for ethnic similarity. Both of these will be discussed in more detail in Section 5 and in Appendix B.

3.5 Identification strategy

The main threat to identification of θ, the impact of an ethnically-similar neighbour set on residential license uptake, is u_i: unobserved household level characteristics which drive both coethnic sorting *and* the demand for tenure. For example, more risk averse households might be more concerned about overall expropriation and thus will both seek extra protection through locating near other coethnic households and also have a higher innate demand for formal tenure, which would bias estimates of θ upward.

Similarly, there might be characteristics which drive coethnic sorting yet depress the demand for tenure. Imagine some households have an innate demand for village-based governance. These households would both desire to locate with coethnics and would have less enthusiasm for a state-backed land tenure instrument. If such preferences are at play, they might result in a spurious negative correlation between c_{i_N} and RL_i.

An ideal situation would be one where residential location had been randomly assigned. Unfortunately, while there are numerous examples of credible natural experiments in coethnic location from developed countries (Edin, Fredriksson, and Åslund 2003; Damm

2009; Algan, Hémet, and Laitin 2011), there are few studies in the East African context where urban location as been subject to a credible level of exogenous variation. Panel data would allow for household fixed effects, but this would also require enough variation in c_{i_N} across time, which might be difficult given the current density of the slum.

In lieu of the ideal, my attempt to solve this identification problem relies on data gathered on the timing of the household's arrival in the slum. Each household was asked about the year they acquired the parcel, allowing me to establish which households were already established when a given household i arrived in the neighbourhood. Define c_{i_B} as the ethnic similarity of all households in the neighbour set which were *already established* when the index household arrived.

Assuming that households only choose locations based on existing rather than future levels of neighbourhood coethnicity, then overall levels of neighbourhood coethnicity should be uncorrelated with unobserved determinants of coethnic location, conditional on c_{i_B}. To be precise, I assume:

$$cov(c_{i_N}, u_i | c_{i_B}, \ldots) = 0 \tag{2}$$

Intuitively, by including c_{i_B} as a control in equation (1), I will be comparing households which chose to locate next to similar numbers of coethnics, but experienced different numbers of coethnics moving in after they arrived.

Several more assumptions need to hold before (2) becomes plausible. Firstly, since we do not observe the actual makeup of the neighbourhood at the time of the households arrival, c_{i_B} needs to be be a good proxy for the surrounding environment at that time: there cannot be other, unobserved parcels occupied at the time which drove the household's location decision. The only model of slum formation which would guarantee this is one in which parcels are acquired either through squatting or subdivision and, once households arrive, they can never leave or move within the mtaa. While the latter requirement is harder to justify (some households own more than one parcel), movement is still infrequent. The former requirement, that households can never leave the mtaa, seems to be backed up by the data: roughly 94% of all parcels were undeveloped (lacking

any sort of structures) at the time they were acquired. This suggests that parcels are empty until they are recorded in the survey as being acquired, and so c_{i_B} should be a good proxy for the ethnic makeup at the time household i arrived.[9]

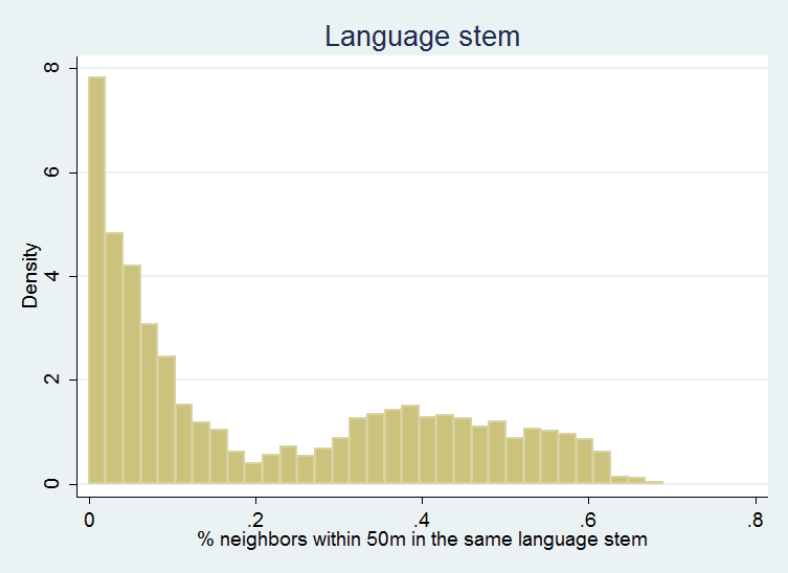
The second prerequisite for (2) to hold is that when choosing their location, households cannot anticipate future inflows of coethnics into their neighbour set. To guard against this, as well as recall error in the year of arrival, I extend c_{i_B} to include not only households which arrived before household i, but also five years after. In essence, all the remaining variation in c_{i_N} will be driven by households which arrived more than five years after i. To impose this restriction I must drop all households from the sample who lack neighbours that arrived more than five years later. This automatically drops all households arriving after 2004. This might have already been a desirable restriction: given that residential licenses were first made available in 2005, the location decision of households becomes more complex once coethnic location and residential license adoption becomes a simultaneous decision.

Finally, conditional on their original choice, households cannot encourage or discourage new coethnics into their neighbour set. While households do have some control over their contiguous neighbours through subdivision, this should be accounted for by the inclusion of all contiguous neighbours from the same tribe as a separate control. However this assumption might still be violated if households have some veto power over land sales in their immediate neighbourhood.

Aside from concerns over u_i, there may be tribe-specific characteristics which can drive both sorting and tenure. Tribes which originate near Dar es Salaam, such as the native Zaramo, may feel they have more secure informal tenure due to more proximate customary institutions and may be more likely to locate near each other due to lower moving costs. It is also important to disentangle sorting from overall size effects: households from tribes with a large presence in the mtaa are more likely to have coethnics in their neighbour set

[9]However, if expropriation risk is one of the main mechanisms at play, there might be concerns that selection out of the sample is still a concern if households are losing entire plots of land to families moving in. Anecdotally, it appears that most expropriation by other households is only partial, with households that have only developed part of their parcel losing the undeveloped portion to households migrating in, as described in Section 2.4. Thus, while expropriation remains a concern for households, it should not result in a sample selection problem, as households as households who have experienced expropriation should not actually drop out of the sample.

Figure 6: Ethnic fractionalisation in Tanzania



due to pure chance, and may feel more protected. Thus, it is important to control for as many tribe-specific characteristics as possible. I do this using a variety of characteristics (including the population size of each language stem in the neighbourhood) and eventually language-stem fixed effects.

3.6 Controls and summary statistics

Following from the empirical specification (1), my measure of coethnicity derived in sections 3.4 and 3.3 is defined as the percentage of neighbours in household i's neighbour set from the same language stem. Figure 6 shows the distribution of this measure across the sample. Note that no household has more than 70% of its neighbours from the same language stem.

For household characteristics I use household size, monthly income (TSh), the natural log of the household's asset holdings,[10] average age and schooling in the household and a dummy for Muslim households. I also include a proxy for how many households from the randomly-chosen network set the household knew and a measure of how familiar the household head is with his or her tribal language. For parcel characteristics, I have

[10]Households were only asked about the size, not the value of their assets. Median values for each asset type from the 2000/01 Tanzanian Household Budget Survey were used to calculate the total wealth stock.

Table 2: Summary statistics

Variable	Mean	(Std. Dev.)	Min.	Max.	N
Applied for RL	0.534	(0.499)	0	1	2247
% same language stem	0.218	(0.2)	0	0.690	2247
Household:					
HH size	5.181	(2.604)	1	20	2247
Log(assets)	14.426	(1.222)	8.313	17.957	2247
HH monthly income (tsh)	470.807	(1834.711)	0	58008.332	2247
HH avg years of schooling	12.293	(2.708)	2	24	2247
HH average age	29.797	(10.066)	9.333	88	2247
Muslim	0.573	(0.495)	0	1	2247
Language fluency	1.389	(1.323)	0	3	2247
# known in network roster	1.082	(1.345)	0	8	2247
Parcel:					
Year parcel aquired	1991.975	(11.908)	1960	2010	2247
Log(parcel size mˆ2)	5.335	(0.553)	3.462	9.095	2247
Parcel was inherited	0.141	(0.348)	0	1	2247
Toilet = pit latrine	0.77	(0.421)	0	1	2247
Electricity connection?	0.603	(0.489)	0	1	2247
Business on parcel?	0.077	(0.266)	0	1	2247
Parcel rented out?	0.394	(0.489)	0	1	2247
Ethnic:					
Dist of tribe homeland to Dar	341.048	(286.8)	29.521	2222.4	2246
Area (km) of tribe homeland	9723.972	(11571.419)	321.348	59972.592	2230
% of tribe in mtaa	0.083	(0.082)	0	0.217	2247
Patrilineal ranking of tribe	1.698	(0.87)	1	3	1982
Geographic:					
Kigogo Kati	0.585	(0.493)	0	1	2247
D to nearest church (m)	631.104	(272.392)	2.684	1239.563	2247
D to nearest field (m)	149.174	(99.430)	0	464.396	2247
D to nearest hazard (m)	428.279	(274.907)	0	961.464	2247
D to nearest mosque (m)	280.558	(148.568)	0.889	737.599	2247
D to nearest path (m)	129.572	(146.885)	0	756.814	2247
D to nearest primary road (m)	290.149	(177.591)	0	641.401	2247
D to nearest river (m)	156.348	(114.211)	0	510.516	2247
D to nearest road (m)	200.559	(144.589)	0	583.463	2247
D to nearest school (m)	228.682	(125.637)	0	578.339	2247
D to nearest mtaa office (m)	347.871	(161.188)	28.652	792.550	2247

included the year the parcel was acquired, the log of the size (m^2) of the parcel and dummy variables for whether or not the parcel was inherited, the presence of a pit latrine, business or electricity connection, and whether any part of the parcel is being rented out. All of these characteristics are included in $\mathbf{X}_i$ as well as average values for the whole neighbour set $\overline{\mathbf{X}}_{i_N}$. Summary statistics for these characteristics are shown in Table 2.

For ethnicity-specific characteristics, I have included the total size of each language stem in the community, the geographic size of of each tribe's district of origin and its distance from Dar es Salaam[11] and measures for how patrilineal each tribe's descent system is.[12] These measures will be wiped out when I subsequently include language-stem fixed effects.

For the vector of geographic characteristics L_i, I include measures of the parcel's distance from a variety of geographic features, including the nearest church/mosque, fields, flood plains (hazard areas), walking paths, primary and secondary roads, schools, rivers and local government offices. I also include a dummy for whether or not the parcel is in Kigogo Kati or Mburahati Barafu. As mentioned before, I also control for the percentage of contiguous parcels who are from the same tribe (to account for the household's control over these parcels and within-family subdivision). Finally, I also control for the total size of the neighbour set N, to avoid conflating size with ethnic effects.

3.7 Inference

In estimation of (1), standard methods of statistical inference would suffice under the assumption of independence across observations. However, given the inherently spatial structure of this specification, this assumption is certain to be violated.[13]

A standard approach would be to make limiting assumptions about the correlation of error terms: for example, assign all parcels to geographic distinct districts and assume no correlation across these districts. However, the density of these unplanned settlements implies that such assumptions would be meaningless as many of these arbitrarily-defined

[11] These measures are estimated using maps provided in *Ethnologue*.

[12] This measure is derived from the *Atlas of Precolonial Societies* (Müller, Marti, Schiedt, and Arpagaus 2000)

[13] It is assured by the design of the specification: as c_{i_N} increases, the probability that other households in i's neighbour set are from the same language stem, and thus have a similar value of c_{i_N} also increases.

districts would be adjacent, and observations along the boundaries of adjacent districts would be highly correlated.

To deal with this spatial dependence, I use a method derived by Conley (1999), where the estimated covariance matrix is adjusted to allow for an arbitrary spatial correlation between observations which declines as the distance between observations grows and is zero beyond a defined threshold. I set this threshold equal to the neighbour set distance cutoff, which for the main specification is fifty meters. I report my main results using the Conley standard errors. Across all esimates θ, the Conley standard errors are uniformly larger and so these can be though of a reasonable upper bound for inference.

4 Results

In this section, I will report the results from the estimation of (1), first as a 'naive' regression, without concern over endogenous sorting, then with controls for the household's choice of neighbours at the time of arrival. Due to the large number of controls I will present only the coefficients of interest here, but extended versions of these tables are available in the appendix (Tables 12 and 13).

4.1 Main results

Table 3 reports the result from the naive OLS regression. The first column shows the results from a simple bivariate regression of RL_i on c_{i_N} and each subsequent column introduces additional sets of the controls described in Section 3.6. Columns (2) and (3) introduce household/parcel characteristics, averages for neighbour sets and location characteristics. Column (4) includes the tribal controls[14] and column (5) uses language-stem fixed-effects.

The first thing to note is the significant, negative correlation between the share of coethnic neighbours and residential license uptake. While the point coefficient tends towards zero as household, contextual and location characteristics are included, introducing tribal controls or tribe fixed effects results in a stronger negative relationship. This sug-

[14]Data for some tribes in unavailable, hence the drop in sample size.

Table 3: Ethnic co-location and residential license takeup

	(1)	(2)	(3)	(4)	(5)
% same stem (50m)	-0.253***	-0.242***	-0.210***	-0.348***	-0.380***
	(0.0535)	(0.0611)	(0.0611)	(0.107)	(0.146)
HH char		Yes	Yes	Yes	Yes
Parcel char		Yes	Yes	Yes	Yes
Neighbor char			Yes	Yes	Yes
Location char			Yes	Yes	Yes
Tribe char				Yes	
Tribe f.e.					Yes
R^2	0.010	0.079	0.127	0.126	0.139
Obs	2247	2247	2247	1978	2247

Conley standard errors in parentheses: $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$
Variable of interest is the percentage of other hhs within 50m from the same language stem
Dependent variable is a dummy for RL takeup

gests that some tribes or language groups are more likely to sort together *and* obtain a residential license.[15]

The point coefficients in these naive regressions are not only significant, but economically meaningful. A 10% increase in the percentage of neighbours from the same stem results in a 3.8% reduction in the predicted probability a household has obtained a residential license. Moving from being completely surrounded by neighbours of a different language stem ($c_{i_N} = 0$) to the maximum observed percentage ($c_{i_N} = .7$) results in roughly a 27% reduction.

Table 4 reports results once c_{i_B}, the percentage of neighbours who arrived either earlier than *or* up to five years after household i who are coethnics is included as a control.[16] The first column replicates column (6) from Table 3. The second column restricts the sample to all households which arrived prior to the year 2005. The third column further restricts the sample to all households which have any neighbours arriving more than five years later. Note that the estimate of θ is lower for this restricted sample.

[15]Through repeated randomization of observed location, it is possible to calculate the expected value of c_{i_N} under the assumption of random assignment. Language stems with a large positive deviation from this value ($c_{i_N} - E[c_{i_N}]$) are observably more likely to purchase a residential license (the correlation coefficient between these two is 0.42).

[16]This includes households which arrived in the same year as the index household.

Table 4: Results controlling for previous coethnic choice

	(1) OLS	(2) t < 2005	(3) Restricted	(4) Final
% same stem (50m)	-0.380***	-0.434***	-0.468***	-0.576***
	(0.146)	(0.165)	(0.171)	(0.219)
% same stem at arrival				0.0972
				(0.123)
HH char	Yes	Yes	Yes	Yes
Parcel char	Yes	Yes	Yes	Yes
Neighbor char	Yes	Yes	Yes	Yes
Location char	Yes	Yes	Yes	Yes
Tribe f.e.	Yes	Yes	Yes	Yes
R^2	0.139	0.141	0.142	0.142
Obs	2247	1886	1784	1784

Conley standard errors in parentheses: $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Column 1 is the full OLS model from the previosu table

Column 2 restricts the sample to parcels acquired prior to 2005. **Column 3** further restricts the sample to those who who had neighbors move in more than 5 years later.

Column 4 introduces a control for the percentage of % of neighbors at arrival (and within 5 years later) from the same language stem.

Dependent variable is a dummy for RL takeup

Keeping the sample size constant, column (4) reveals the estimate of θ once c_{i_B} is included as a control. The result is a further downward movement in θ^*. Despite a decrease in precision, the point estimate is still highly significant. A 10% increase in the percentage of coethnics in a household's neighbour set is now associated with nearly a 6% decrease in the predicted probability the household has obtained a residential license. Moving from complete isolation to the maximum saturation seen in the data ($c_{i_N} = 0.70$) results in a 40% decrease in the probability of having obtained an RL. While it is not significant at standard levels of inference, the positive coefficient (0.0972) on c_{i_B} indicates that households which moved into ethnically similar areas are actually more likely to purchase a CRO.

4.2 Channels

While the results in the previous sections suggest a persistently negative partial correlation between how ethnically similar a household's surrounding environment is and its demand for a residential license, the underlying mechanisms are not yet obvious. As discussed in section 2.4, the presence of coethnic neighbours may reduce a household's perceived expropriation risk, thus reducing the need to buy in to the formal tenure system. However, there might be other factors at play here: there is some evidence that landowners in Dar es Salaam believed that obtaining an RL would give them access to credit (Midheme 2007), and anecdotal evidence suggests that, after RLs were extended to a five year period, many formal lending organisations began accepting them as a form of collateral. As there is already some evidence that informal credit is often provided along ethnic ties (Fafchamps 2000; Biggs, Raturi, and Srivastava 2002; Fisman 2003), households with preexisting connections might put less value on residential licenses. Furthermore, informal land tenure might be a range of other club goods provided by coethnics. Given the tax burden implied by RL ownership, households isolated from their ethnic peers may be more likely to adopt because they desire access to state-provided public goods which they cannot obtain in their immediate neighbourhood.

As households were interviewed well after their decision to purchase a residential license, it is impossible to directly identify the channel through which ethnic sorting is depressing demand for tenure. However, the reduced-form 'impact' of having coethnic neighbours on household beliefs and behaviours might still suggest which channels might be active, even following the residential license choice. To test this, I consider three different measures of the expropriation, credit and public goods channels.

The first is perceived expropriation risk: during the baseline survey, households were asked to estimate the probability that they would lose their land within the next five years. My second outcome measure is a dummy for whether or not the household has borrowed, from any source in the past year.[17] Finally, while we do not observe any direct evidence of a household's consumption of public or club goods, we do observe a household's

[17]The results are similar using measures of perceived ability to borrow rather than actual borrowing behaviour.

Table 5: Coethnic location and possible channels of tenure demand

	Expropriation risk		HH has borrowed		Given to public goods?	
	(1)	(2)	(3)	(4)	(5)	(6)
% same stem (50m)	-0.230**	-0.260*	0.0189	0.0662	-0.00320	0.0197
	(0.0967)	(0.136)	(0.0758)	(0.0947)	(0.149)	(0.200)
% same stem at arrival		0.0274		-0.0431		-0.0209
		(0.0830)		(0.0541)		(0.116)
Standard controls	Yes	Yes	Yes	Yes	Yes	Yes
Tribe f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.117	0.117	0.134	0.134	0.085	0.085
Obs	1715	1715	1715	1715	1715	1715

Conley standard errors in parentheses: $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Dependent variables: (i) the perceived probability of expropriation in the next five years, (ii) indicator variable = 1 if the household has borrowed in the past five years, and (iii) indicator variable = 1 if the household has contributed anything to neighborhood public goods in past year

contribution levels to local (mtaa-level) public goods,[18] so the dependent variable in this specification is a dummy equal to one if a household has ever contributed to any public good in the past year (only 30% of the sample have done so). If households can choose between goods self-provided with their immediate neighbours and higher levels of public goods provision, we should see a negative relationship between having coethnic neighbours and mtaa-level public goods provisions.

Table 5 shows the results of regressing these three measures on c_{i_N} and the other controls listed in Section 3.6. The results suggest that perceived expropriation risk is somewhat mitigated by the presence of coethnic neighbours: a 10% increase in the share of neighbours from the same language stem is associated with roughly a 2.5% decrease in perceived expropriation risk. Both the propensity to borrow and contribute to local public goods appear to be effectively orthogonal to c_{i_N}. While this does not guarantee that expropriation risk is the main channel through which coethnic neighbours suppress the demand for RLs, it appears to be the most plausible connection when weighed against a few reasonable alternatives. While residential license status is not included in these specifications, the results are robust to its inclusion.

[18]This includes public toilets sewerage, garbage collection, recycling, road building or repair, street lights, neighbourhood security and a local infrastructure upgrading project.

5 Robustness checks

5.1 Ethnic versus religious or family enclaves

While this paper has focused on ethnicity as being the most pertinent social dimension to investigate, it is possible that religion might also play a role. These two are somewhat correlated, as many of the 'indigenous' tribes from Tanzania's east coast have strong roots in Islamic practice, while migrants from the west tend to be from tribes with a predisposition towards Christianity. Historically, religion has been a more significant social cleavage in Dar es Salaam's local politics, although much of this has been fairly conspicuous racial politics (i.e. the indigenous population at odds with migrants from South Asia) (Brennan 2007).

To reaffirm that the results in the previous sections are not conflating the two types of identity, I have re-run the main specification, including the percentage of households in the neighbour set with the same religion (Christian or Muslim) as the index household. The results are presented in Table 8 in columns (1) and (2). θ^*, the coefficient on c_{i_N} is of a slightly larger magnitude once religious similarity is controlled for. The coefficient on religious similarity is insignificant, but positive. This confirms not only that religious heterogeneity is not driving the main results, but that it is, at best, a predictor of uptake.

Finally, it might still be the case that ethnic similarity is just acting as a proxy for kinship, with the measured effect running through direct family ties rather than indirect ethnic channels. To account for this, I use roster data from the baseline survey to match households with similar name structures. I isolate the middle and last names for every member of the household, convert them to a common character set using the Stata 11 command `Soundex`. This allows me to isolate similar-sounding middle and last names without relying on identical spelling. I then calculate the percentage of neighbours who have at least one household member with a similar middle or last name to at least one member of the target household. Columns (3) and (4) in Table 8 show that the inclusion of this variable has no substantial effect on the results here, suggesting that they are not being driven by nearby relatives.

What about channels? While in Section 4.2 I showed that coethnic location was

correlated with perceived expropriation risk and not credit access or contributions to public goods, it is also worth investigating whether these alternate measures of neighbour similarity upset that result. Table 14 in the appendix replicates the main specification from Table 5, this time including both the percentage of same-religion neighbours and same-name neighbours as controls. Again, the percentage of coethnic neighbours appear to be correlated with a reduction in perceived expropriation risk, while neither the name or religion measures are significantly correlated with any of the three outcomes.

5.2 Measuring coethnicity

Given that my main measure of coethnicity is constructed, it is possible the results presented in previous sections are unique to this definition. In this section I will present results from the estimation of (1) with two alternate measures of coethnicity.

The first is Fearon's (2003) measure of cultural similarity. A detailed description of the construction of this measure can be found in Appendix B. Fearon's measure is useful as it utilizes information on how many branches of the language tree two language groups share, rather than just evaluating whether or not two language groups share a particular branch. Using this approach, c_{i_N} now becomes a measure of the average cultural similarity between household i and its neighbour set N.[19] Similarly, c_{i_B} is also calculated using this new measure.

Table 6 displays the results from this exercise. Columns (1) and (2) shows the bivariate and full-controls specifications respectively.[20]

Columns (3) and (4) make the same restrictions found in Table 4, where the sample is restricted first by year of arrival, then to those that have neighbours arriving more than five years later. While the inclusion of c_{i_B} results in a less precise estimate of θ, which is only significant at the 10% level, the estimate itself does not change much, and is still negative.

[19]For each household-neighbour pair, Fearon's measure is calculated, then this is averaged across the entire neighbour set.

[20]Note that 27 observations have been dropped from this specification. The measure of cultural similarity results in a minority of tribes having close to zero similarity with their neighbours (these are typically tribes/language groups from outside Tanzania) with the rest of the sample having values between 0.6 and 0.95. Those below 0.6 are excluded from this specification.

Table 6: Alternate specification - average cultural similarity

	(1) OLS	(2) OLS	(3) t < 2005	(4) Restricted	(5) Final
Avg cultural similarity (50m)	-1.330***	-1.301**	-1.728**	-1.835**	-1.718*
	(0.357)	(0.653)	(0.748)	(0.762)	(0.906)
Cultural similarity at arrival					-0.165
					(0.673)
Standard controls		Yes	Yes	Yes	Yes
Tribe f.e.		Yes	Yes	Yes	Yes
R^2	0.007	0.156	0.165	0.169	0.169
Obs	2220	2220	1866	1764	1764

Conley standard errors in parentheses

$^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Dependent variable is a dummy for RL takeup

Table 7: Alternate specification: average tribal distance

	(1) OLS	(2) OLS	(3) t < 2005	(4) Restricted	(5) Final
Avg tribal distance	0.0212***	0.0496	0.0677**	0.0703**	0.0850*
	(0.00807)	(0.0313)	(0.0340)	(0.0353)	(0.0454)
Previous C	No	No	No	No	Yes
HH char	No	Yes	Yes	Yes	Yes
Parcel char	No	Yes	Yes	Yes	Yes
Neighbor char	No	Yes	Yes	Yes	Yes
Tribe f.e.	No	Yes	Yes	Yes	Yes
Location char	No	Yes	Yes	Yes	Yes
R^2	0.003	0.156	0.163	0.167	0.168
Obs	2230	2230	1875	1771	1771

Conley standard errors in parentheses. $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Dependent variable is a dummy for RL takeup

Table 8: Religious similarity and RL uptake

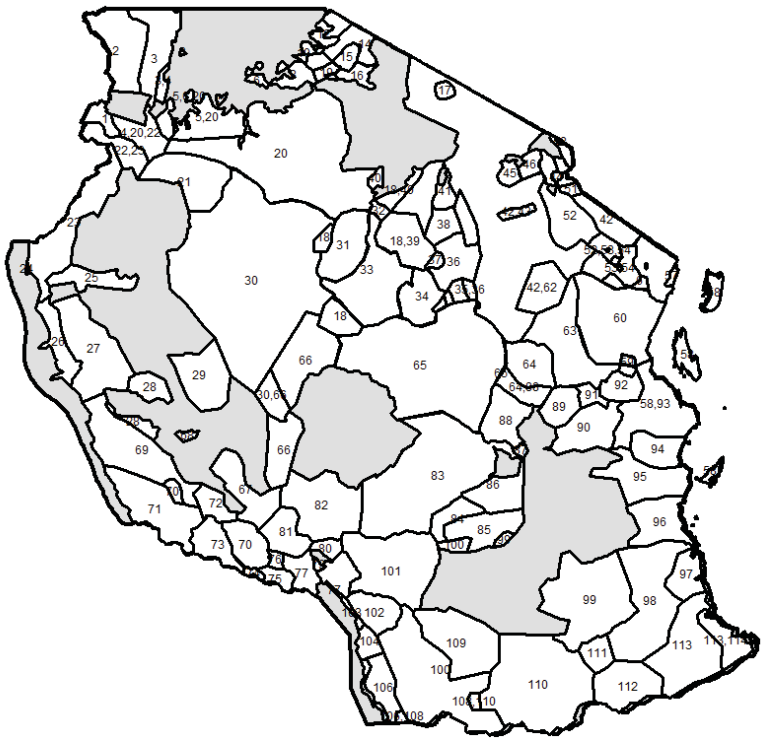
	(1)	(2)	(3)	(4)
% same stem (50m)	-0.488***	-0.594***	-0.474***	-0.585***
	(0.172)	(0.219)	(0.171)	(0.218)
% same religion	0.128	0.128		
	(0.0931)	(0.0932)		
% same stem at arrival		0.0956		0.100
		(0.122)		(0.122)
% same name			0.163	0.167
			(0.170)	(0.170)
Standard controls	Yes	Yes	Yes	Yes
Tribe f.e.	Yes	Yes	Yes	Yes
R^2	0.143	0.143	0.142	0.143
Obs	1784	1784	1784	1784

Conley standard errors in parentheses

$^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Dependent variable is a dummy for RL takeup

Figure 7: GIS language map of Tanzania (constructed using maps from *Ethnologue*)



My other measure of ethnic similarity uses maps provided in *Ethnologue* detailing the approximate geographic origins of each language group in Tanzania (Lewis 2009). Figure 7 shows the map, which not only shows locations, but also the size of these tribal 'regions'. To approximate the exact coordinates and sizes of these territories, I overlaid *Ethnologue*'s map on a geographic information system (GIS) map of Tanzania, then calculated the average distance, in spherical coordinates, between each tribal region.

The result is a measure of ethnic similarity which captures actual physical distance between the tribes, which may capture cultural differences not covered in purely linguistic measures. Table 7 shows the results when c_{i_N} is recalculated using the average tribal distance between a household and its neighbours. While a lack of precision has knocked significance to the 10% level once restrictions are made, the results are still strikingly similar to that of the previous specifications, with the point estimate growing larger in magnitude with the inclusion of c_{i_B}. Note that because c_{i_N} now measures distance, rather than similarity, the point coefficients are reversed in sign.

5.3 Different neighbour sets

In this section I will consider whether changing the value of d substantially affects the main results. Table 9 shows estimates of θ when d is set at both 25 and 75 meters respectively, both before and after c_{i_B} is included as a control. Accordingly, the cutoffs used in calculating the Conley standard errors are set at the same distance d in each specification. Observation counts are different for the two specifications, as these samples are restricted to household that experience changes in their neighbour set after five years. When larger geographic cutoffs are used, each household as a higher probability of having new neighbours move in, hence the 75m specification has a larger sample.

While the coefficients presented in this table are broadly similar to the main specification, their precise values are not immediately comparable. Recall that the original estimate of θ could be interpreted as "the effect of an increase in the share of coethnic neighbours within 50 meters." Using larger (smaller) values of d allows more (less) neighbours into the neighbour set, so a 50% increase in the share of coethnics would result in a larger increase in the *number* of coethnic neighbours for larger values of d. Thus, we might expect estimates of θ to be larger, as they correspond to the impact of a larger number of people. However, as d increases, the neighbours it brings in are further away and so are probably less relevant to the household's decision to purchase a land title, which would mitigate the upward pressure on θ.

Despite this, the results seem to be robust under these perturbations of d, as Table 9 shows significant, negative effects for both cutoffs.

5.4 Spatial fixed effects

Despite the multitude of controls for land quality and geographic characteristics (listed in Section 3.6) which were included in the previous specifications, it is still possible that coethnicity is correlated with unobserved geographic characteristics which drive residential license take-up. Recall the original empirical residential license adoption equation:

$$RL_i = \gamma + \theta c_{i_N} + \beta \mathbf{X}_i + \delta \overline{\mathbf{X}}_{i_N} + L_i + u_i + \varepsilon_i$$

Table 9: Main specification using different distance cutoffs

	25m		75m	
	(1)	(2)	(3)	(4)
% same stem within distance d	-0.268**	-0.334**	-0.432**	-0.725***
	(0.128)	(0.155)	(0.206)	(0.280)
% same stem at arrival		0.0595		0.269
		(0.0796)		(0.180)
Standard controls	Yes	Yes	Yes	Yes
Tribe f.e.	Yes	Yes	Yes	Yes
R^2	0.144	0.144	0.146	0.147
Obs	1628	1628	1819	1819

Conley standard errors in parentheses, cutoffs used set to 25 and 75 respectively.
$^{*}p < 0.10,^{**} p < 0.05,^{***} p < 0.01$
Dependent variable is a dummy for RL takeup

If u_i contains neighbourhood specific effects which are also correlated with c_{i_N}, estimates of θ will be biased, even after controlling for the household's decision to sort with coethnics. This would be a problem if, for example, groups of coethnics reside in areas with poorer land quality.[21] While many studies are able to overcome this by including some sort of geographic fixed effects, the density of the households in this sample make it difficult to identify distinct areas where assumptions about the independence of unobserved characteristics are likely to hold.

One approach is to assume that unobserved heterogeneity in land quality is similar over spatially-proximate households, identifying the effect of interest off of the spatial discontinuity in residential license adoption and in coethnicity. Ignoring household-level unobservables for a moment, this assumption implies that for two observations, i and j, within some critical distance, $u_i = u_j = u$. This approach was first introduced in Goldstein and Udry (2008) and Conley and Udry (2010) to control for unobserved soil characteristics, and has been used by several studies to control for unobserved spatial heterogeneity (Ayalew Ali and Goldstein 2011; Magruder 2012a; Magruder 2012b). In this 'spatial fixed effects' (SFE) specification, the original empirical equation (1) is transformed

[21] In an agricultural setting, quality often refers to unobserved soil characteristics. In this urban setting, where very little agriculture is performed, it comprises a range of attributes which factor into the household's valuation of land, such as geographic distance to infrastructure and services, risk of flooding or hazard, etc.

by subtracting the average values for spatially-proximate neighbours:

$$RL_i - \sum_{j \in R(i)} \frac{RL_j}{N_p} = \theta \left(c_{i_N} - \sum_{j \in R(i)} \frac{c_{j_N}}{N_p} \right) + \beta \left(\mathbf{X}_i - \sum_{j \in R(i)} \frac{\mathbf{X}_j}{N_p} \right) + \delta \left(\overline{\mathbf{X}}_{i_N} - \sum_{j \in R(i)} \frac{\overline{\mathbf{X}}_{j_N}}{N_p} \right) + \left(L_i - \sum_{j \in R(i)} \frac{L_j}{N_p} \right) + \left(u_i - \sum_{j \in R(i)} \frac{u_j}{N_p} \right) + \left(\varepsilon_i - \sum_{j \in R(i)} \frac{\varepsilon_j}{N_p} \right) \quad (3)$$

Where $R(i)$ is a set of neighbours within a critical distance of household i and N_p is the number of neighbours within that critical distance. For the sake of simplified notation, let $y_i - \sum_{j \in R(i)} \frac{y_j}{N_p} = \triangle y_{ij}$. If the above assumption over u_i holds, then the term $\triangle u_{ij}$ should vanish from the above equation. More precisely, for θ to be identified, then $\triangle c_{ij_N}$ must be uncorrelated with $\triangle \varepsilon_{ij}$, conditional on the other transformed controls.

How likely is this assumption to hold? It is plausible, given the geographic and parcel-level controls already included in the main specification, that the SPE specification would successfully difference out any remaining geographic unobservables, so long as spatially-proximate households share a similar environment. However, u_i contains not only parcel/geographic-level unobservables, but also unobserved household characteristics which may be correlated with c_{i_N}. If households sort on these unobservables, then proximate neighbours will share similar characteristics, and it is likely that these will also be differenced out. Yet, if households primarily choose their coethnic mix c_{i_N} due to some unobserved preference also correlated with residential license take-up, and this preference is not continuous over space, then spatially-proximate difference in coethnicity $\triangle c_{ij}$ might still reflect differences in preferences, even after applying the SFE estimator. Thus, while this approach provides another opportunity to reject the null hypothesis that the identification assumptions in previous sections are correct, it is unlikely that it convincingly deals with the problem of endogenous sorting.

Table 10: Main results, spatial fixed effects specification

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) t < 2005	(6) Restricted	(7) Final
% same stem (50m)	-0.219***	-0.163**	-0.173***	-0.292*	-0.397**	-0.449**	-0.471**
	(0.0561)	(0.0636)	(0.0637)	(0.162)	(0.178)	(0.184)	(0.229)
% same stem at arrival							0.0201
							(0.122)
HH char		Yes	Yes	Yes	Yes	Yes	Yes
Parcel char		Yes	Yes	Yes	Yes	Yes	Yes
Neighbor char			Yes	Yes	Yes	Yes	Yes
Location char			Yes	Yes	Yes	Yes	Yes
Tribe f.e.				Yes	Yes	Yes	Yes
R^2	0.007	0.074	0.081	0.094	0.093	0.098	0.098
Obs	2247	2247	2247	2247	1886	1784	1784

Columns 1-4 replicate the results shown in Table 3 using spatial differencing (spatial fixed effects) **Column 5** restricts the sample to parcels acquired prior to 2005. **Column 3** further restricts the sample to those who who had neighbours move in more than 5 years later. **Column 4** introduces a control for the percentage of neighbors at arrival (and within 5 years later) from the same stem. Dependent variable is a dummy for RL takeup.
Conley standard errors in parentheses: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 10 shows the results of applying the spatial fixed effects estimator to the main specification presented in Tables 3 and 4. Cutoffs for the SFE difference set $R(i)$ are set equal to 50m, the same as used for calculating c_i and $\overline{\mathbf{X}}_{i_N}$. The structure mimics that of the previous tables, with the first four columns gradually introducing several controls, the fifth and sixth column making sample restrictions before introducing a control for the coethnic choice in column (7). The results show a negative, significant impact of coethnic residence on residential license take-up, although they are of slightly lower magnitude (roughly 80% of the original point estimates).

5.5 Coethnicity and residential license take-up across Dar es Salaam

While the main result of this paper is robust several different specifications, it is possible that the negative relationship between coethnic residence and residential license adoption is context-sensitive and does not generalise to the rest of Dar es Salaam. In this sub-section I test whether or not this relationship exists at a larger level, utilising administrative data obtained from each of the three municipalities comprising Dar es Salaam during a land registration exercise undertaken in 2004.

Together, the municipal governments have gathered data on parcel ownership for approximately 220,000 plots across the city, including basic characteristics of the parcel and the name of the owner. In addition to this, each municipality keeps records on residential license ownership, as well as GIS information indicating the exact location of the parcel. However, the land registry data does not contain any ethnic-specific identifies, so it is impossible to identify the tribe of each owner using this information alone.

To overcome this problem I propose a novel ethnic identification method using tribe-specific surnames. As a household roster was administered for both land-owning households and a sub-set of renting households in the TLRS, the resulting data contains over 14,000 named household members who are also identified by tribe. Using this data, I isolate last names which are estimated to be tribe-specific: they do not occur more than once for any given Tanzanian tribe in the TLRS. The result is a list of 2851 surnames, comprising 75 different tribes and 30 different language stems.[22] I then match this list

[22]Tribe-specific last names are calculated first, *then* are assigned a language-stem, rather than language-

of surnames to those in the municipal government database of landowners. Out of the 188,000 land parcels with an owner-name listed, approximately 25,000 have a successful name match to the tribe-specific name list. Using this matched sample, I recreate the basic specification from Section 4: for every parcel I identify the percentage of (successfully named-matched) neighbours within 50m who are from the same estimated language stem, as predicted by their last name. I then estimate equation 1 using this measure as a proxy for c_{i_N}, municipal administrative data to measure RL take-up, and a small number of covariates from the land registry data as controls.

This approach is likely to be problematic for several reasons. First, the name matching is likely to be highly imprecise, despite the large number of last names identified in the TLRS. This, combined with the error in matching to the administrative database and the smaller number of identified neighbours, is likely to result in a large amount of measurement error in c_{i_N}, so estimates of θ will be subject to attenuation bias. Second, households with tribe-specific names might be different in unobservable ways than those with more general names. Finally, as there is no administrative data on the date these plots were acquired, it is impossible to control for the ethnic-similarity of the neighbour set at the time the parcel was obtained.

Keeping these issues in mind, Table 11 presents the result of re-estimating equation 1 using the administrative data on a households RL acquisition (at any point between 2004 and 2013) and predicted tribal affiliation. Column (3) presents the results controlling for neighbour characteristics and sub-ward fixed-effects, column (2) introduces language-stem fixed effects and column (3) introduces administrative block fixed effects. In all three columns, the percentage of neighbours within 50m who are estimated to be of the same language stem is negatively correlated with the probability the household purchases a residential license for that plot. While the point coefficient, which ranges from -0.08 and -0.17, is significantly smaller than in other results, this is consistent with attenuation bias due to significant error in measure coethnicity in the data. While alone these results are merely suggestive of a relationship between coethnicity and residential license take-up, they reinforce the main findings in the rest of the paper.

stem specific names being calculated separately.

Table 11: Ethnic co-location and RL take-up across Dar es Salaam

	(1)	(2)	(3)
% neighbours same (estimated) language stem (50m)	-0.0783***	-0.167***	-0.143***
	(0.0246)	(0.0484)	(0.0482)
Formal employment?	-0.0717***	-0.0726***	-0.0713***
	(0.00668)	(0.00667)	(0.00699)
# hhs living on plot	-0.0105***	-0.00872***	-0.00917***
	(0.00241)	(0.00234)	(0.00238)
# rooms	0.0142***	0.0127***	0.0108***
	(0.00155)	(0.00155)	(0.00160)
# people living on plot	-0.00137	-0.000306	-0.000276
	(0.000867)	(0.000849)	(0.000862)
Plot is on hazard land	-0.535***	-0.533***	-0.531***
	(0.00968)	(0.00988)	(0.0129)
Log(plot area)	0.0342***	0.0256***	0.0361***
	(0.00562)	(0.00560)	(0.00596)
Mixed use plot	-0.0230	-0.0206	-0.0198
	(0.0286)	(0.0288)	(0.0292)
Residential plot	-0.0668***	-0.0474*	-0.0395
	(0.0241)	(0.0242)	(0.0253)
Positive plot value	-0.192***	-0.174***	-0.173***
	(0.0229)	(0.0223)	(0.0236)
Pos val × Ln(plot value)	0.0101***	0.00903***	0.00898***
	(0.00129)	(0.00126)	(0.00135)
Neighbour char	Yes	Yes	Yes
Sub-district f.e	Yes	Yes	No
Block f.e.	No	No	Yes
Language stem f.e.	No	Yes	Yes
R^2	0.112	0.122	0.074
Obs	22454	22454	22454

Standar errors clustered at block level: $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Dependent variable is a dummy = 1 if HH obtained RL between 2004 and 2013

6 Conclusion

Despite a deceleration in rates of urban growth in the last few decades, the rise of unplanned settlements in many cities remains a conundrum for policymakers. While providing landowners with recognised tenure is seen as one of several tools for ushering these settlements into formality, the success of demand-driven approaches such as Tanzania's will hinge upon the ability of policymakers to understand what drives this demand.

To take a small step in that direction, I have examined the effect of living with coethnic neighbours on the demand for residential licenses, one of the two most recent urban tenure instruments offered by the Tanzanian government. Despite controlling for a number of factors which might have determined both a household's coethnic sorting and the demand for tenure, there is a robust negative relationship between the two. The results also seem reasonably robust to small changes in the definition of coethnic and in neighbour, and do not appear to be proxying for other types of social connections, such as religion or direct kinship.

While the result that small ethnic enclaves might have a depressed demand for formal tenure might be disconcerting to those concerned with formalisation, there are a number of caveats which should be taken into account. Firstly, the effects revealed here are not the main drivers of the residential license program's lacklustre performance: the most insulated households exhibit over 30% less demand than the most isolated, yet most households are somewhere in between. While clustering is associated with lower demand, the intense and unchecked fractionalisation of the slum seems to have prevented these neighbourhoods from becoming too clustered. In this light, heterogeneity might complement formalisation, as a fractured population which is unable to self-provide crucial public goods will be more likely to accept state provision. It is unclear, however, whether such fractionalisation is more desirable from a welfare perspective.

Next, I have only presented a trade-off between ethnic ties and a single tenure instrument, one which is particularly weak along many dimensions (collateral value, transferability, durability) and so may be a particularly poor substitute for the protection afforded by those of a similar cultural background. This has been a significant concern in the aca-

demic literature on land tenure, that formal programmes focused on title and registration strip away many of the desirable, flexible features of informal/cutomary tenure systems (Platteau 2000; Udry 2012). Discerning which dimensions matter most for substitutability should be of particular concern here, and might be a useful path for future research. More substantive forms of tenure, such as the prohibitively expensive certificate of right of occupancy, may be strictly superior to residential licenses along the dimensions which matter most to residents of unplanned settlements.

It should be emphasised that the results in this paper are highly context-dependent. As discussed before, tribal affiliation does not appear to have the same salience in Tanzania as it does in many neighbouring countries. The general lack of ethnic sorting in Dar es Salaam stands in stark contrast to countries where ethnicity is more polarising, such as Kenya.[23] While ethnicity does appear to matter for formal tenure decisions in Dar es Salaam, it is possible that this relationship would become more complex in contexts where groups are more polarised.

Finally, this work reveals that, while overall levels of ethnolinguistic heterogeneity are still important, there is still much to be learned about how heterogenous societies transition from framework of segregation and self-provision to one of integration and state-provision.

[23] A brief analysis of ethnic sorting using geo-referenced data from Kibera, Nairobi's largest slum, reveals both lower levels of heterogeneity (a Herfindahl Index of 0.6639) and stronger clustering of ethnic groups

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A Additional tables/figures

Table 12: Ethnic co-location and RL take up, full results

	(1)	(2)	(3)	(4)	(5)
% same stem (50m)	-0.253***	-0.242***	-0.210***	-0.348***	-0.380***
	(0.0535)	(0.0611)	(0.0611)	(0.107)	(0.146)
% adjacent in same tribe		0.100*	0.0646	0.0346	0.0667
		(0.0565)	(0.0546)	(0.0586)	(0.0549)
# of neighbors (50m)		0.00298***	0.00202*	0.00260**	0.00205*
		(0.000934)	(0.00118)	(0.00128)	(0.00120)
HH size		0.0147***	0.0131***	0.0139***	0.0141***
		(0.00493)	(0.00480)	(0.00533)	(0.00486)
Log(assets)		-0.00475	0.00449	0.00401	0.00463
		(0.00991)	(0.00954)	(0.0100)	(0.00948)
Monthly income (tsh)		-0.00000414	-0.00000326	-0.00000343	-0.00000387
		(0.00000346)	(0.00000347)	(0.00000375)	(0.00000345)
Avg years of schooling		0.00788*	0.00664	0.00653	0.00605
		(0.00420)	(0.00409)	(0.00425)	(0.00421)
Average age		0.000332	0.00131	0.00152	0.00149
		(0.00130)	(0.00129)	(0.00138)	(0.00127)
Muslim		-0.0142	0.00116	0.0159	-0.00235
		(0.0229)	(0.0230)	(0.0274)	(0.0248)
Tribal language fluency		0.00920	0.0129	0.00821	0.0110
		(0.00864)	(0.00836)	(0.00877)	(0.00836)

Table 12: Ethnic co-location and RL take up, full results - *continued*

	(1)	(2)	(3)	(4)	(5)
Network measure		0.0306***	0.0320***	0.0293***	0.0324***
		(0.00838)	(0.00877)	(0.00919)	(0.00870)
Log (parcel size m^2		-0.00742	-0.0133	-0.0123	-0.0161
		(0.0197)	(0.0207)	(0.0224)	(0.0206)
Parcel was inherited		-0.161***	-0.146***	-0.128***	-0.146***
		(0.0303)	(0.0302)	(0.0326)	(0.0300)
Toilet = pit latrine		0.0274	0.0279	0.0262	0.0292
		(0.0255)	(0.0246)	(0.0261)	(0.0246)
Power connection?		0.145***	0.153***	0.142***	0.150***
		(0.0234)	(0.0224)	(0.0242)	(0.0222)
Business on parcel?		0.0539	0.0420	0.0325	0.0486
		(0.0395)	(0.0383)	(0.0419)	(0.0384)
Parcel rented out?		-0.00863	0.00235	0.0165	0.00112
		(0.0222)	(0.0213)	(0.0223)	(0.0216)
Year parcel obtained		-0.00102	-0.00180*	-0.00264**	-0.00203**
		(0.00104)	(0.00102)	(0.00110)	(0.00103)
Avg N Age			-0.0532	-0.0688	-0.0587
			(0.0462)	(0.0492)	(0.0462)
Avg N Network			-0.0112	0.0388	-0.0130
			(0.0406)	(0.0454)	(0.0412)
Avg N schoolng			0.00352	-0.00187	0.00248
			(0.0313)	(0.0331)	(0.0315)
Avg N age			0.00953	0.00704	0.0111*
			(0.00624)	(0.00664)	(0.00626)
Avg N income			-2.42e-08	-3.75e-08	-2.86e-08
			(4.41e-08)	(4.59e-08)	(4.50e-08)
Avg N HH size			0.0310	0.0293	0.0362
			(0.0325)	(0.0358)	(0.0323)
Avg N Muslim			-0.0534	-0.0456	-0.0509
			(0.123)	(0.132)	(0.125)
Avg N fluency			-0.131**	-0.126**	-0.129**
			(0.0530)	(0.0568)	(0.0537)
Avg N renting			-0.256	-0.293*	-0.284*

Table 12: Ethnic co-location and RL take up, full results - *continued*

	(1)	(2)	(3)	(4)	(5)
			(0.164)	(0.173)	(0.165)
Avg N business			0.104	0.173	0.148
			(0.266)	(0.291)	(0.269)
Avg N inherited			-0.567**	-0.543**	-0.585**
			(0.243)	(0.258)	(0.248)
Avg N toilet			-0.242	-0.224	-0.198
			(0.161)	(0.174)	(0.163)
Avg N power			-0.193	-0.297**	-0.214
			(0.140)	(0.148)	(0.141)
Avg N p size			-0.118	-0.0717	-0.110
			(0.0888)	(0.0957)	(0.0891)
Kigogo Kati			0.122*	0.126	0.125*
			(0.0738)	(0.0774)	(0.0734)
D to church			-0.0000324	-0.0000595	-0.0000369
			(0.000118)	(0.000128)	(0.000117)
D to field			0.0000547	0.0000371	0.0000853
			(0.000175)	(0.000181)	(0.000177)
D to hazard land			-0.000275	-0.000243	-0.000318
			(0.000291)	(0.000308)	(0.000289)
D to mosque			0.000520	0.000544	0.000549
			(0.000415)	(0.000431)	(0.000416)
D to footpath			-0.0000442	0.0000264	-0.00000449
			(0.000346)	(0.000364)	(0.000341)
D to main road			-0.000334*	-0.000249	-0.000333
			(0.000200)	(0.000219)	(0.000204)
D to river			-0.000357	-0.000484	-0.000399
			(0.000280)	(0.000295)	(0.000283)
D to road			-0.0000545	-0.000184	-0.0000333
			(0.000338)	(0.000347)	(0.000335)
D to school			-0.0000364	-0.0000431	-0.0000471
			(0.000295)	(0.000316)	(0.000293)
D to mtaa office			-0.000572**	-0.000629**	-0.000629**
			(0.000269)	(0.000285)	(0.000272)

Table 12: Ethnic co-location and RL take up, full results - *continued*

	(1)	(2)	(3)	(4)	(5)
Tribal distance to Dar				-0.0000365	
				(0.0000688)	
Size of tribal homeland				-0.000000491	
				(0.00000107)	
# of coethnics in mtaa				0.470**	
				(0.207)	
Descent type (major)				0.0204	
				(0.0205)	
Constant	0.536***	2.213	5.599**	7.369***	6.113***
	(0.0177)	(2.098)	(2.178)	(2.344)	(2.229)
Tribe f.e.	No	No	No	No	Yes
R^2	0.010	0.079	0.127	0.126	0.139
Obs	2247	2247	2247	1978	2247

Conley standard errors in parentheses: $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Variable of interest is the percentage of other hhs within 50m from the same language stem

Dependent variable is a dummy for RL takeup

B Fearon's measure of cultural similarity

First established by Fearon (2003) as an extension to standard Herfindahl-based measures of ethnolinguistic fractionalization, the measure of 'cultural similarity' is calculated as:

$$\tau_{ij} = \left(\frac{l_{ij}}{m}\right)^{\delta} \tag{4}$$

Where l is the number of shared branches between languages i and j and m is the maximum number of branches in the set of languages being considered. δ is a tolerance parameter, determining how much weight is given to earlier over later shared branches.[24] I use the same formula, with a slight modification to the way m is calculated.[25]

[24]Fearon (arbitrarily) sets this parameter = 0.5, although other authors have suggested alternative values (Desmet, Ortuño-Ortín, and Wacziarg (2012) use a value of $\delta = .05$). I use Fearon's preferred value for consistency. The resulting measure (4 takes a value between zero and one.

[25]Instead of setting m equal to the maximum number branches in the total set of languages, I set it

Table 13: Results controlling for previous coethnic choice

	(1) OLS	(2) t < 2005	(3) Restricted	(4) Final
% same stem (50m)	-0.380***	-0.434***	-0.468***	-0.576***
	(0.146)	(0.165)	(0.171)	(0.219)
% adjacent in same tribe	0.0667	0.0656	0.0771	0.0818
	(0.0549)	(0.0575)	(0.0600)	(0.0601)
# of neighbors (50m)	0.00205*	0.00270**	0.00303**	0.00299**
	(0.00120)	(0.00135)	(0.00137)	(0.00136)
HH size	0.0141***	0.0107**	0.0102*	0.0103*
	(0.00486)	(0.00526)	(0.00541)	(0.00540)
Log(assets)	0.00463	0.00360	0.00199	0.00184
	(0.00948)	(0.0102)	(0.0104)	(0.0104)
Monthly income (tsh)	-0.00000387	-0.00000387	-0.00000201	-0.00000214
	(0.00000345)	(0.00000534)	(0.00000659)	(0.00000656)
Avg years of schooling	0.00605	0.00386	0.00317	0.00317
	(0.00421)	(0.00465)	(0.00475)	(0.00476)
Average age	0.00149	0.00143	0.00153	0.00153
	(0.00127)	(0.00137)	(0.00139)	(0.00139)
Muslim	-0.00235	-0.00183	-0.000817	-0.000436
	(0.0248)	(0.0271)	(0.0274)	(0.0274)
Tribal language fluency	0.0110	0.00336	0.00490	0.00476
	(0.00836)	(0.00919)	(0.00945)	(0.00945)
Network measure	0.0324***	0.0295***	0.0300***	0.0299***
	(0.00870)	(0.00918)	(0.00917)	(0.00916)
Log (parcel size m^2	-0.0161	-0.0158	-0.0201	-0.0202
	(0.0206)	(0.0221)	(0.0230)	(0.0230)
Parcel was inherited	-0.146***	-0.164***	-0.182***	-0.183***
	(0.0300)	(0.0344)	(0.0359)	(0.0358)
Toilet = pit latrine	0.0292	0.0232	0.0173	0.0174
	(0.0246)	(0.0273)	(0.0286)	(0.0286)
Power connection?	0.150***	0.155***	0.155***	0.155***
	(0.0222)	(0.0243)	(0.0248)	(0.0248)
Business on parcel?	0.0486	0.0525	0.0375	0.0389
	(0.0384)	(0.0406)	(0.0412)	(0.0412)
Parcel rented out?	0.00112	-0.00596	-0.0120	-0.0118
	(0.0216)	(0.0234)	(0.0242)	(0.0242)
Avg N Age	-0.0587	-0.0873*	-0.0961*	-0.0963*
	(0.0462)	(0.0513)	(0.0526)	(0.0526)
Avg N Network	-0.0130	-0.00883	-0.00903	-0.00761

Table 14: Coethnic location and possible channels of tenure demand

	Expropriation risk		HH has borrowed		Given to public goods?	
	(1)	(2)	(3)	(4)	(5)	(6)
% same stem (50m)	-0.241**	-0.271**	0.0200	0.0678	-0.0188	0.00748
	(0.0979)	(0.137)	(0.0772)	(0.0953)	(0.150)	(0.199)
% same name	0.00741	0.00855	-0.0193	-0.0211	-0.116	-0.117
	(0.110)	(0.110)	(0.102)	(0.103)	(0.168)	(0.168)
% same religion	0.0731	0.0730	-0.00298	-0.00281	0.133	0.133
	(0.0544)	(0.0544)	(0.0522)	(0.0523)	(0.0844)	(0.0843)
% same stem at arrival		0.0273		-0.0436		-0.0240
		(0.0826)		(0.0545)		(0.115)
Standard controls	Yes	Yes	Yes	Yes	Yes	Yes
Tribe f.e.	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.117	0.118	0.134	0.134	0.086	0.086
Obs	1715	1715	1715	1715	1715	1715

Conley standard errors in parentheses: $^{*}p < 0.10,^{**}p < 0.05,^{***}p < 0.01$

Dependent variables: (i) the perceived probability of expropriation in the next five years, (ii) indicator variable = 1 if the household has borrowed in the past five years, and (iii) indicator variable = 1 if the household has contributed anything to neighborhood public goods in past year

equal to the maximum number of branches for each of the two languages being considered, as I feel this results in a better localized measure of cultural similarity.